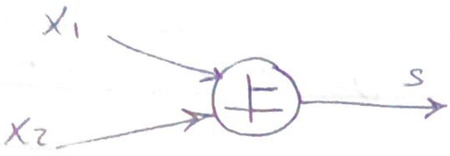
10/12/2016 السبت م. محمد عبدالله سكشن [8]

hebbian



* $e = d - s$

for	$d = 0$	$s = 0$	⇒ correct
for	$d = 0$	$s = 1$	⇒ overprediction
for	$d = 1$	$s = 0$	⇒ underprediction
for	$d = 1$	$s = 1$	⇒ correct

S1

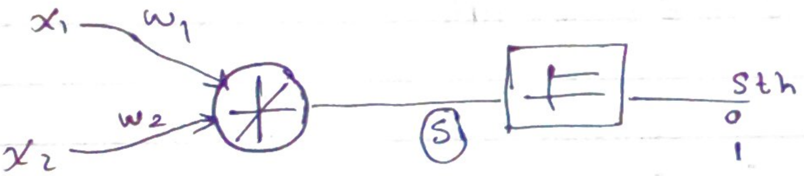
S2

$$w^1 = [w_1^1 \quad w_2^1]$$

$$w_1^1 = w_1^0 + \Delta w$$

$$\Delta w = e * X * B$$

New Learning method: Linear neuron



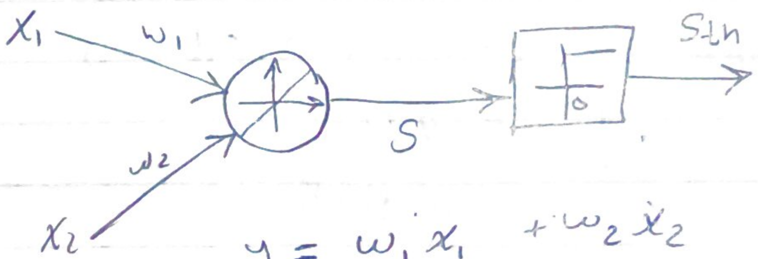
دون الفرق → $S = y$; $e = d - s$

assume $s = -1.1 < 0 \Rightarrow s_{th} = 0 \quad d = 1$ (underpred.)

$s = 2 > 0 \quad s_{th} = 1 \quad d = 1$ (correct)

* example

x_1	x_2	d
0.3	0.7	1
-0.6	0.3	0
-0.1	-0.8	0
0.1	-0.45	1

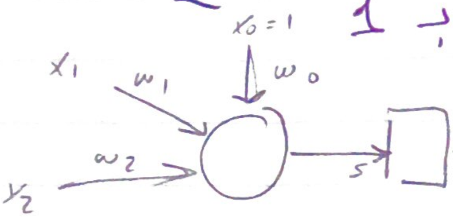


$$y = w_1 x_1 + w_2 x_2$$

x_0	x_1	x_2	d
1			
1			
1			
1			

لو فيك Bias

بنضيف x_0 بـ 1



ويكون شكل الشبكة

<< Bias بدون تم بـــــأ كله >>

* initial weight

Assume $\beta = 0.5$

(Training iteration 1)

$w_1^0 = 0.8 \quad w_2^0 = -0.5.$

* sample 1 $(0.3, 0.7)$; $d = 1$

$y = (0.8)(0.3) + (0.7)(-0.5) = -0.11$

$S = y = -0.11 < 0$

$\Rightarrow S_{th} = 0$; $d = 1$ (underprediction)

$e = d - S = 1 + 0.11 = 1.11$

update weights

$\therefore w_1^1 = w_1^0 + \beta x_1 e = 0.9665$

$w_2^1 = w_2^0 + \beta x_2 e = -0.1115$

*Sample 1 with w^1

$y = 0.2119 = S > 0 \Rightarrow S_{th} = 1$ & $d = 1$ (correct)

* sample 2 $(-0.6, 0.3)(d=0)$

$w_1^1 = 0.9665$

$w_2^1 = -0.1115$

$y = -0.613 = S < 0 \Rightarrow S_{th} = 0$; $d = 0$ (correct)

* sample 3 $(-0.1, 0.8)(d=0)$

$w_1^1 = 0.9665$

$w_2^1 = -0.1115$

$y = -0.00745 = S < 0 \Rightarrow S_{th} = 0$; $d = 0$. (correct)

* sample 4 $(0.1, -0.45)(d=1)$

$$w_1' = 0.9665$$
$$w_2' = -0.1115$$

$y = 0.1468 = S > 0 \Rightarrow S_{th} = 1$ & $d = 1$ (correct)

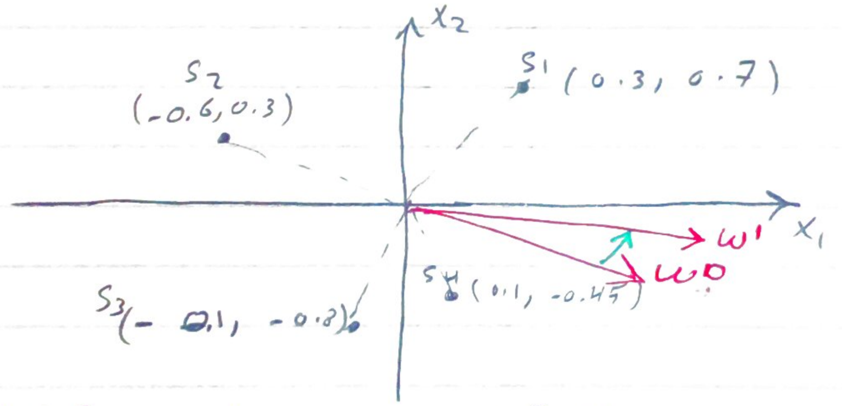
final weight $w' = [0.9665 \quad -0.1115]$ ← vector

Testing

x_1	x_2	$y = S$	S_{th}	d	classification
0.3	0.7	0.2119	1	1	Correct
-0.6	0.3	-0.613	0	0	//
-0.1	-0.8	-0.00745	0	0	//
0.1	-0.45	0.1468	1	1	//

Motion of weight vectors during Learning

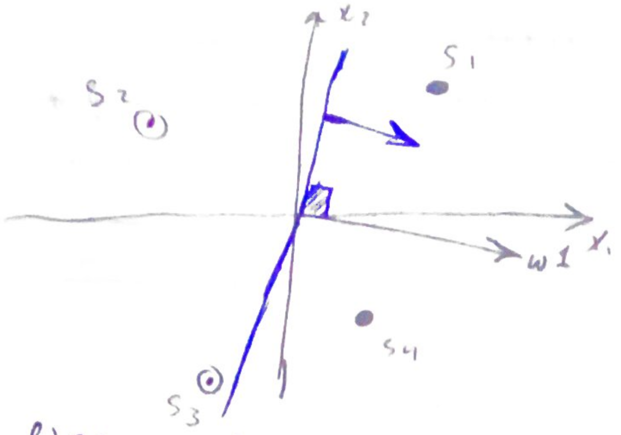
$$w^0 = \begin{bmatrix} 0.8 \\ -0.5 \end{bmatrix}, \quad w^1 = \begin{bmatrix} 0.9665 \\ -0.1115 \end{bmatrix}$$



* يحصل underprediction وأنا شغال صح S_1 فمضطر أحرك شوية في اتجاه S_1

* ارسم خط الفصل (مطلوب) (باللون الأزرق)

Classification Boundary



seperation line $y = 0$.

$0.9665 x_1 - 0.1115 x_2 = 0$

$\Rightarrow x_2 = 8.67 x_1$

← لاحظ أن اتجاه ال weight هو اتجاه ال orientation